$2{\times}\tau$ Trigger
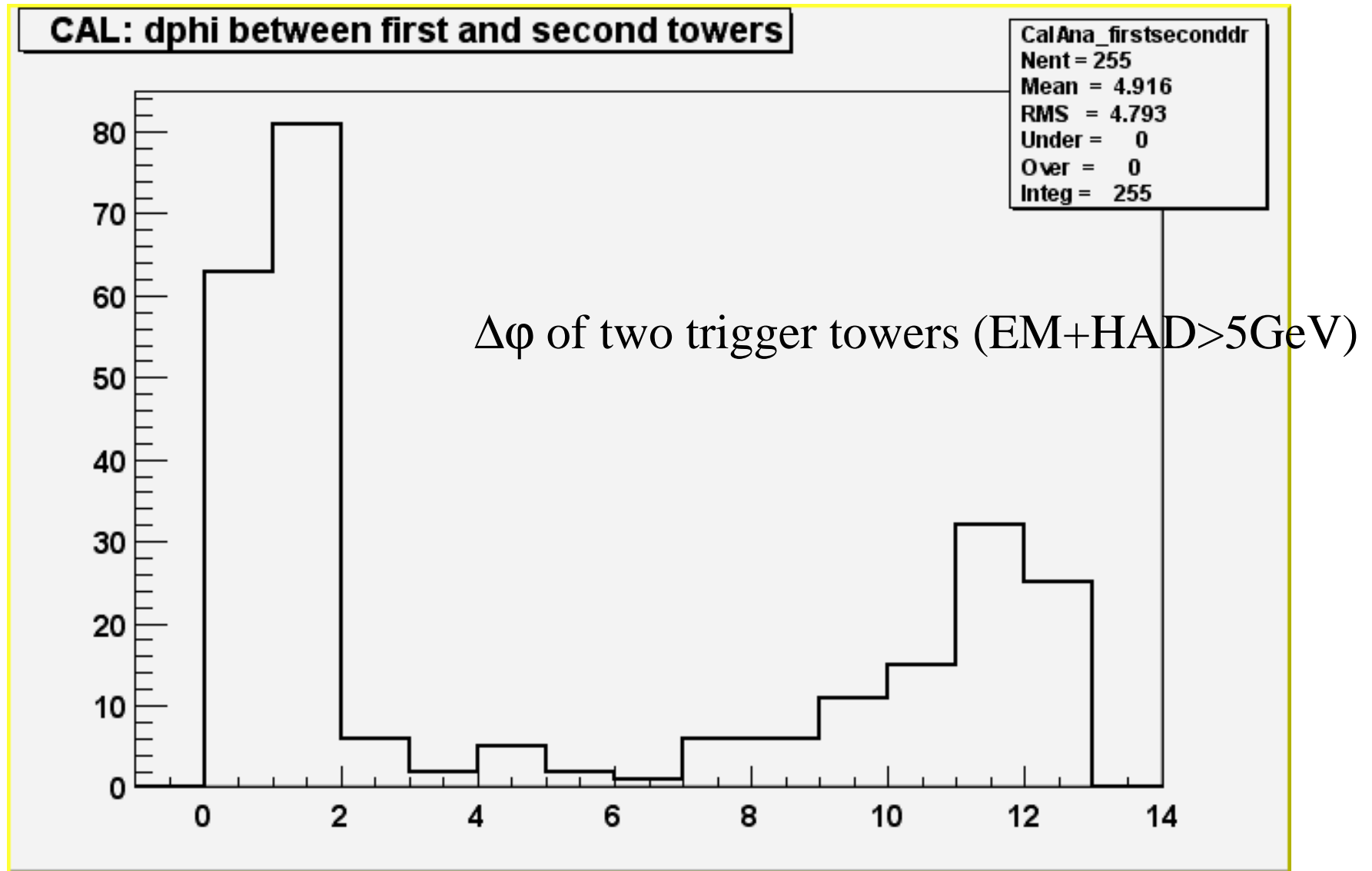
Updated: with more understanding of CDF Run II data

F.Ratnikov, Rutgers. 11/07/2001

- L1: $2{\times}$ central tower with $E_{total}>5\text{GeV}$
  - Estimated rate: $6.3\mu\text{b}$ non-overlapping

- L2: central jet $E_T>10\text{GeV}$, isolated seed track $p_T>6\text{GeV/c}$
  - Estimated rate: 55 nb

- L3: $2{\times}$ CdfTau objects are reconstructed
  - Estimated rate: 5 nb

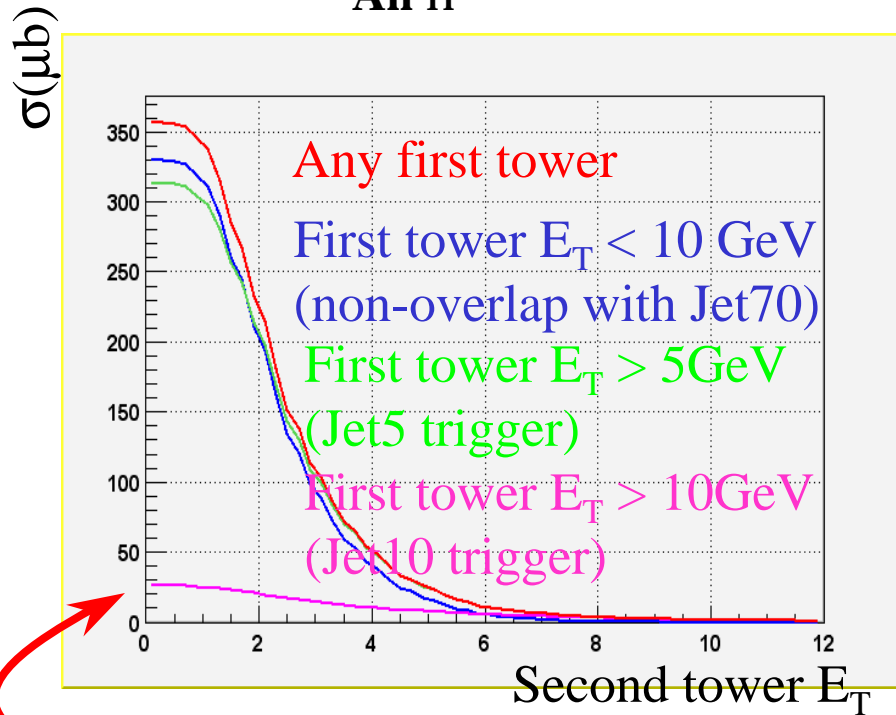Stream G Data: Run 119619, 93772 events, 40 nb^{-1}

Use Jet5 data sample (L1 PS20, L3 PS50), 1 event/25 nb
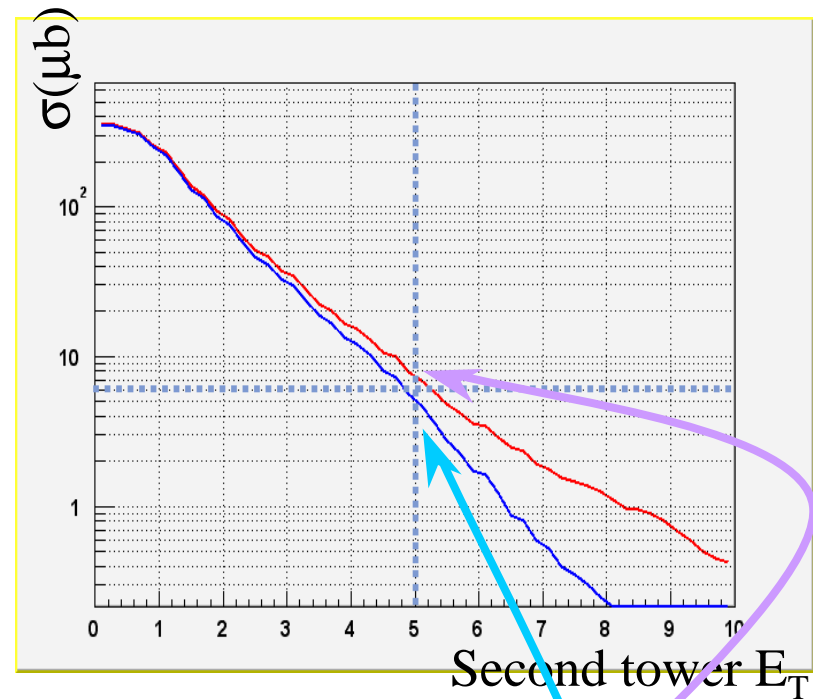
Consider Adjacent Towers As Well

CAL: dphi between first and second towers

CalAna_firstseconddr
Nent = 255
Mean = 4.916
RMS = 4.793
Under =   0
Over =   0
Integ = 255

$\Delta\varphi$ of two trigger towers (EM+HAD>5GeV)

L1 Rates

All h

Any first tower

First tower $E_T < 10$ GeV
(non-overlap with Jet70)

First tower $E_T > 5$GeV
(Jet5 trigger)

First tower $E_T > 10$GeV
(Jet10 trigger)

Second tower E_T

Central Calo

Second tower E_T

- Reference rate (Jet10) is on place – 27 µb
- Using 2×(EM+HAD>5GeV), L1 rate is 8 µb
- **Nonoverlaped L1 rate is 5 mb**

L3 τ Selection

- TauFinder: calo seed $E_T > 3$GeV, calo $E_T > 3$GeV, track seed $p_T > 4$GeV/c – 2479 candidates

- Track Isolation: no tracks $p_T > 1$GeV/c in 10°...30° annulus around seed – 931 candidate (38%)

- Pairs of candidates – 173, isolated – 19 (11%) : isolation cut suppression is factorized

- $E_T > 10$GeV without track isolation – 548 candidates pairs – 26 events

- Seed track p_T – extra suppression

Track isolation

Seed track p_T suppression
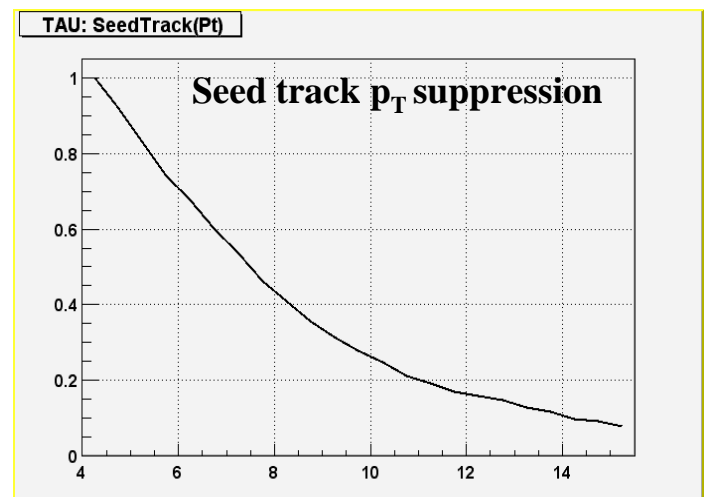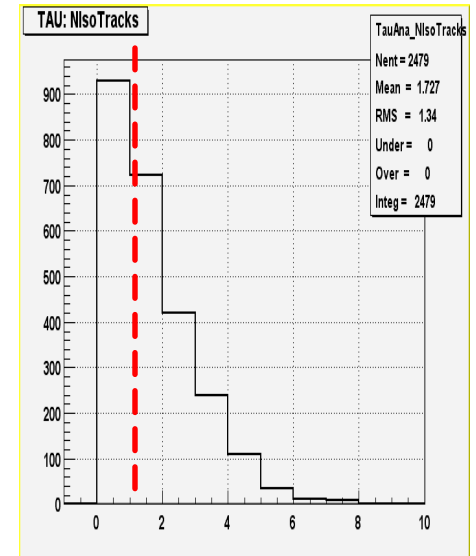
L3 rate estimation

- 25 nb per event

- 26 events with 2×(nonisolated CdfTau with $E_T > 10 GeV$)

- Track isolation suppression – $(38\%)^2 = 0.14$

- (Seed track p_T cut suppression)^2

TAU: SeedTrack(Pt)
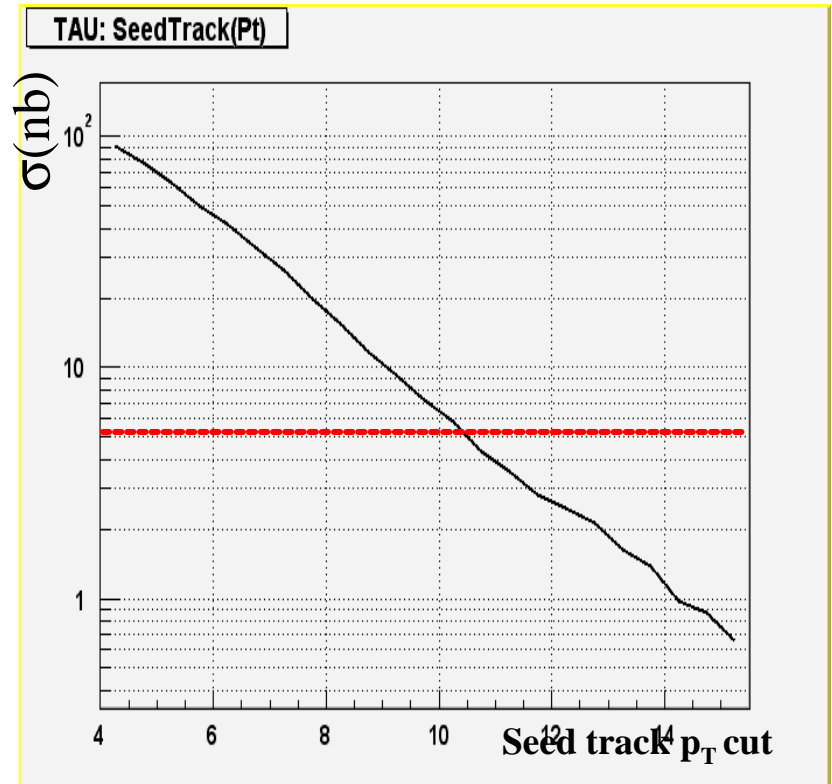
5 nb can be reached with $p_T > 10 GeV/c$ requirement

Can signal be saved?

- Even 50 nb ($p_T > 6\text{GeV}$) is only 0.5 Hz @ 10^{31}

- CDF classic track isolation ($\Sigma|p_T|$ in cone 0.4 around τ) can give another factor of ~3 (Pasha's study)

- CDF classical Calo isolation ($\Sigma|E_T|$ in cone 0.4 around τ) can give another suppression, though L2 studies on Run I data showed strong correlation between track and Calo isolations

- Multidimensional tuning of essential cuts (seed E_T, seed p_T, τ p_T, isolation...) – optimizing signal/background is necessary